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ANOMALIES IN LOGIC.

LOGIC has the reputation of being a very definite and precise science — as definite and precise as pure mathematics. As a formal science it, no doubt, is so. But it is not its purely formal character that gives it the value for which it is presumably a part of a college curriculum. Its rules are assumed to regulate our practical thinking. But I question whether, apart from the laws of identity, contradiction, and excluded middle, there is any science which has to qualify its formulae so frequently in its application as does the science of logic. This is partly for the general reason that all material application of principles is liable to exceptions, but mainly for the reason that some of the traditional rules of thinking are either arbitrary, or recognize only a peculiarity of Aristotelian usage, which was merely a reflection of Greek language, and, therefore, of Greek thought. Or if it be maintained that Greek usage did not differ from the present, we have only the first alternative to recognize as the common defect of all theories of formal thought. Not that their arbitrariness makes them in any respect untrue, so far as their sphere of application is concerned, but that this sphere in practice is a very circumscribed one. So various are the material conditions under which some logical laws have to be applied, that to accept them, as expressed in formal logic, is only to prepare the way for disregarding them in the first sentence we meet. Indeed, we are inevitably reminded of the proverb about Greek, Latin, and German grammars; namely, that the exceptions are more numerous than the rules. When this is the case, one wonders why any but a disciplinary value can be given to Logic as a study. Though this opinion is a hasty one, it is quite natural, and logicians have only themselves to blame, if they do not provide for contingencies that are certain to bring their general rules into disrepute.

The chief difficulty to which I allude is found in the theory of Opposition. There are other instances of similar importance, but they cannot receive any attention in the present article. I can only consider those which concern a very large portion of existing discussions and controversy, and which at the same time show such discrepancies between formal principles and material practice as to very seriously impugn the practical value of logic, unless we are at the same time informed of principles operating independently of the formal law.

The theory of Opposition has a certain speculative value, and is also assumed to have an equally practical value. Throwing aside the former characteristic for a moment, the second feature is supposed to describe the law of consistency and inconsistency between propositions, in order that we have a practical criterion for deciding the truth or falsity of certain statements in a controversy. Thus, if a man asserts proposition *A* (universal affirmative) we may test its validity, in a measure, by comparing it with *E* and *O* (respectively the universal and the particular negatives). The controversialist is said to refute *A* easiest by the proof of *O*, and that he exposes himself to a like refutation by *I* (particular affirmative) if he attempts to base his refutation upon the assertion or proof of *E*. But now it is to be shown that, while this may be true for the formal laws of Opposition, practice is so different from this that we must either set up a new law, or modify the assumptions made about the nature and signs of particular propositions as well as universals.

The Square of Opposition is based upon certain assumed peculiarities of the quality and quantity of propositions. Thus, *A* and *O*, and *E* and *I*, are said to be contradictories, which is to say that they are mutually inconsistent, while *A* and *E* are only contraries, which is to say that though both cannot be true, they may both be false at the same time. But in actual practice contradiction seems to exist between propositions which are either both universals, or both particulars, or are neither universals nor particulars. Thus, for example, take the propositions, "Religion is true," and "Religion is not true." Of course I shall be told that these are "general" propositions which must be reduced to their quantitative equivalents before the relation of Opposition can be rightly determined. But while the force of this claim is quite admissible, it can be made only on the supposition that we can have no other principle by which to measure the relations in question, all of which can be denied. Not that any reproach is to be cast upon the usual laws of Opposition, but that there is no use to strain them for the sake of finding some remote application of them in ordinary experience. Some other rule might do as well.

The incident which called my attention to the need of a more careful exposition of Opposition than is usually given to it is the following. I have quite generally observed that the ordinary student can very readily perceive that if *A* be true, *E* must be false, and *vice versa*, but he does not so readily admit that if *A* be false, *E* is indeterminate. The fact induced me to ask the question why this mistake should occur. There seems so often a psychological tendency to commit the error, that one suspects there may be a truth at the bottom of the phenomenon, and on careful investigation I have come to the conclusion that there is such a truth, based upon mental operations not provided for in the recognized formal signs of propositions and their meaning. Thus the true contradictory of "Religion is true," is not "Some religion is not true," but "Religion is not true," as I think every one would readily admit. The reason for this fact will be stated again. Let it suffice at present to suggest the assumptions made by the accepted laws of Opposition and the need of modifying them for general practice.

Thus, for example, if I assert an *A* proposition, qualified by its sign "All," and some one denies it, he is supposed in ordinary logical parlance to imply the truth of *O*, but quite as frequently in actual controversies it is assumed that the denial of what is taken for an *A* proposition carries with it the truth of its contrary *E*. The fact simply calls attention to the arbitrary assumption that all propositions can be interpreted according to the relations of quantity and quality expressed in the accepted theory of Opposition, and what I wish to show here is either the existence of propositions to which formal rules do not apply, or the need of multiplying the theoretical principles of Opposition in order to meet a variety of thought relations not hitherto reckoned with in logic.

In the current theory the relations of contradiction, contrariety, and subalternation are based upon the assumptions, not stated by the logician, that *A* and *E* are taken distributively, and *I* and *O* unambiguously; that is, the sign "some" denotes *a part, and it may or may not be the whole.* The least modification or variation from these assumptions in practice must make the rules perfectly useless, at least as mechanical agencies for testing the truth of certain assertions under any conditions. Thus, if my propositions are *collective* in their import, the rules for subalternation are absurd, and we know that considerable of our actual reasoning turns upon this very function of judgment. Again, if the word "some," or the thought involved without using the term, mean *only a part and not all,* the relation of subalternation is again modified, and neither *A* nor *E* can be true when *I* or *O* is true. Perhaps this duplex use of "some" in practice is more common than the one on which the current rules are founded. Similar exceptions occur with the use of what are called "general," and perhaps should be called "generic" propositions, which I shall notice after showing the complications involved in the variations from the assumptions upon which rests the current theory.

To show what a limited application to actual practice the usual rules have, I have only to call attention to the ambiguities of the term "All." First, this has a distributive, second, a collective, and third, a duplex or implicative import. The third meaning is that of *all and no less,* and is connected with propositions where the predicate is conceived as so essential to the subject that a separation in one case involves a separation in all. Now, as we have seen, the ordinary formula for Opposition is founded upon nothing but the first of these meanings, where no *necessary* connection is involved between subject and predicate. Thus, if I affirm distributively that "All men believe in the existence of a first cause," it is sufficient to show the falsity of the proposition if some one proves that "some men (say certain savages) do not believe in the existence of a first cause." If the former be true, however, the latter is false, as we know. But if any affirmation be collective in its meaning, the case is different. Thus I affirm, "The English constitute a nation," meaning, of course, "all Englishmen" taken collectively. Now, according to the ordinary rule, the truth of this would involve the falsity of the proposition *O*, "some Englishmen do not constitute a nation." But, in comparison with the former, this is true instead of being false, and *I* would be false instead of true. The Square of Opposition would then stand as in Fig. 1.

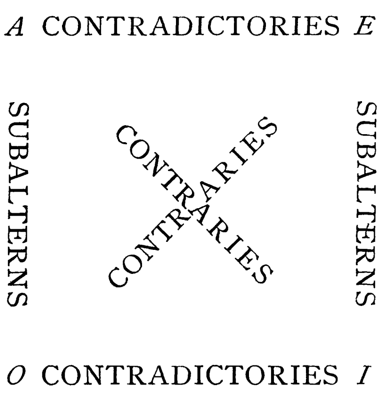

FIG. 1.

This is in some respects simpler than the ordinary theory because of the order of contradictories involved. Not that it can be substituted for it, but that there is a usage, and a very extended one, that requires the application of the principle involved in collective conceptions. At the same time, we could just as well attempt to make this the universal formula as to do so with the accepted theory. The real truth is that neither one of them has a universal application, and that for actual practice we need the use of both of them.

Nor do these two instances exhaust the whole case. There is a third case, different from both the current formula and the one just explained. If I mean by my proposition, or its sign, *the whole and no less* than the subject, as in the combined use of "any and every," and "each and every," and occasionally the word "all," the relations of Opposition must stand as in Fig. 2.

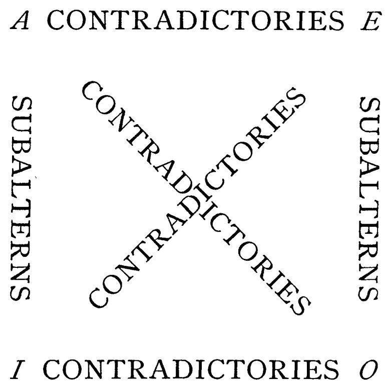

FIG. 2.

But a still more complicated result occurs when we take the particular proposition, or the term "some" to mean something else than what is assumed in the ordinary view. As already stated, in the usual acceptation of formal logic, "some" means *a part, and it may or may not be all;* but in actual practice it often, if not most frequently, means *only a part,* or *not all,* and this fact very greatly alters the whole relation of Opposition. Sir William Hamilton, looking at this matter, went so far as to propose that this meaning of the term be adopted as the proper one for formal logic. The relations of Opposition expressed by it would be as in Fig. 3. This shows us nothing but a relation of contradiction all the way through, except in the case of *I* and *O*, and we can understand why Hamilton desired to establish this usage as the proper one, because it so greatly simplifies the principles for practice. He did not live, however, to develop his doctrine.

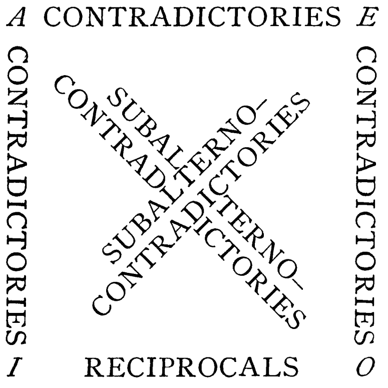

FIG. 3.

Theoretically it will be quite as interesting to trace the relation between particular propositions differently interpreted. Take *Ix* and *Ox* to represent the usual meaning of "some" in formal logic, and *Ia* and *Oa* to represent that of Hamilton and general practice and we shall find a very instructive system of opposition.

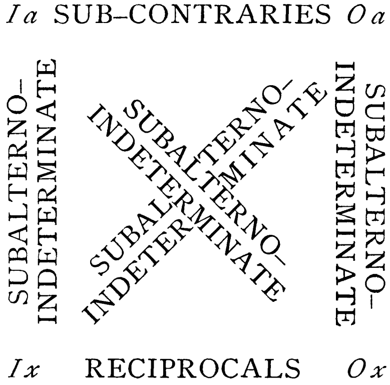

Fig. 4.

In this representation the sub-contraries are the same as in ordinary logic, but the reciprocals imply each other: if one be true, the other is true, and if false, the other is false. But the relation between *Ia* and *Ox*, and *Ia* and *Ix* is a very interesting and complicated one, which I have denominated "subalterno indeterminate" for the lack of a better term to express it. It can be indicated as follows:

If *Ia* be true, *Ix* and *Ox* are indeterminate.
If *Ia* be false, *Ix* and *Ox* are false.
If *Ix* be true, *Ia* and *Oa* are true.
If *Ix* be false, *Ia* and *Oa* are indeterminate.

No practical interest of any great importance attaches to these facts, except that between the ordinary indefinite "some" and the partitive "some" a contradiction is possible under certain conditions, and they show besides this the complications with which we have to deal in actual discourse and argument, compared with the simple rules of formal logic, which seem to be applicable only to an imaginary world. These may all be summarized in a single figure showing the perplexities due to the ambiguous conception of particular propositions. Moreover the illustration assumes the ordinary interpretation of *A* and *E*: otherwise the complications would be still more confusing.

But even all these complications will be greatly increased or modified if we assume *A* and *E* to be collective instead of distributive in their meaning, and we need not illustrate it for the

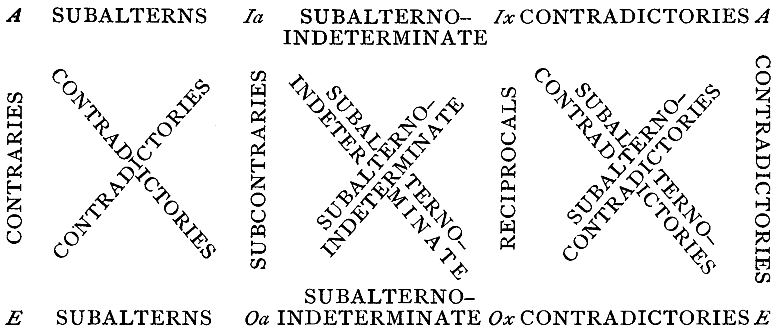

FIG. 5.

student of logic. He can easily work it out from what is indicated in Figure 2.

The most important deviation, however, from the ordinary course of opposition is that in which apparently *universal* propositions in *A* and *E* are contradictories instead of contraries, and either remove the possibility of *I* and *O*, or permit them under an entirely different conception from any that I have mentioned. I refer to such propositions as "Religion is true," "Science is absolute knowledge," "Vital force is electricity," "War is not an evil," "The existence of government functions is necessary to preserve order," "Truth is essential to man's welfare," etc. The same is true of singular propositions such as "Plato was a philosopher," "Socrates was wise." In these instances the contradictory does not follow the rule for opposition, which demands the use of "some," but is the same proposition with the opposite quality, such as "Religion is not true," "Socrates was not wise," etc. Nor is it any reply to this criticism of the discrepancy between formal logic and general practice to say that common discourse uses the term "contradiction" rather loosely and does not distinguish between the law of contrariety and contradiction, but vaguely refers to any inconsistency in the way of holding two propositions at the same time. This very apology would be a justification of the position that I am here maintaining; namely, that formal logic in its rules for opposition has very little to do with the regulation of actual practice and so does not describe the actual law of our thinking, but only its operation in an imaginary case, or in a limited sphere. What I want to indicate in my criticism is a method of adjusting its principles to the wants of current reasoning, and this can be done only by multiplying the rules for conditions not reckoned with in the ordinary canons of opposition, though the general principle is there recognized.

The difficulty comes from the attempt on the part of logicians to adjust the classification of propositions for the Figures and Moods of the syllogism to the laws of opposition, and thus simplify the problem, when in reality the two should not be thus articulated. The simple classification of judgments is that of the universal and particular for quantity, and the affirmative and negative for quality. All propositions which appear to be of another form are reduced to one or the other of these, and for the purposes of the syllogism this is unquestionably correct. But not so with the problem of opposition. Here we should distinguish the *singular* and the *abstract*, generic or general proposition from both the universal and particular, as well as recognize the distinction between distributive and collective propositions and the ambiguous indices of quantity in propositions. When this is done, we shall no doubt greatly complicate and multiply the rules for practice, but at the same time we shall have done something to harmonize formal logic with the needs of actual reasoning.

The accepted canons of Opposition make no provision for singular proposions. They are founded solely upon the conception of universals and particulars as defined for determining the Moods and Figures of the syllogism. They assume that singular propositions are reducible to universals, which is true in so far as the *relation* between subject and predicate is concerned, but is not true in respect of *quantity*. It is the latter fact, therefore, that forces us to modify the law of Opposition for them. A singular proposition can have no corresponding particular without totally changing the import of the word "some." To say "some Socrates was wise," as a supposed particular of "Socrates was wise" is merely to use the term "some" without any rational meaning at all, and to say "some of Socrates was wise" is only to depart wholly from the proper meaning of the term in Opposition, and sets up a *spacially* partitive for the *numerically* partitive signification of the term, which latter is the proper one in Opposition and for particular propositions. The consequence of this is, as above remarked, that singular propositions have no corresponding particulars and hence their contradictory must be the same proposition with a change of quality. Thus the contradictory of "Socrates was wise" must be "Socrates was not wise," and moreover it will have no contrary.

Now the important fact to be considered in thus concluding that singular propositions do not follow the law of universals in the scheme of opposition is that they represent a very large percentage of the argument carried on in the world. I may sometimes be using a word or phrase that seems to represent a universal, but is nevertheless singular in its intended meaning. This is especially true of propositions beginning with "the" or "this." Let us illustrate this from cases simply picked up at random. The first sentence that catches my eye in a newspaper editorial is "Thus in the twenty-third district an effort is made to prevent the threatened election, etc." Now the contradicting of this is not "Some effort is not made," but "No effort is made," because the writer is speaking not of effort in general, but of a particular effort, although the sign of the proposition may be taken as that of a universal. In the same editorial *seven* out of the ten sentences are singular, only one is universal, and this is ambiguous, and two are ambiguous particulars. In another editorial *eleven* propositions are singular and *one* possibly particular, but ambiguous. This only shows that the ordinary rules of opposition cannot apply in determining the method of proof or refutation.

There is a still larger class of propositions which give rise to the same difficulty with the rules for opposition. There are what I shall call *abstract* propositions, which Bosanquet denominates generic, and some writers, general propositions. They are easily interpreted as universals, but when so interpreted their real import is changed. Thus I say "Charity is a virtue," and in order to give this statement a quantitative meaning I must conceive it as denoting "All individual cases of charity are virtuous." But this is not what I necessarily mean by my proposition. The abstract form means to convey the idea that the essential quality of concrete instances is virtuous or a virtue. So when I say "Science is useful," I do not necessarily mean that "All sciences are useful," but only that the method at the basis of the concrete sciences is useful, and this is by its very nature a singular quality or object. Abstract propositions, therefore, such as "Charity is virtuous," "Psychology is a mental science," "Truth is valuable," must be treated as singulars, and so can have only contradictories and neither contraries nor subalterns. Thus the contradictories of the above would be "Charity is not virtuous," "Psychology is not a mental science," etc. Nor will it do to reply to this claim, that the true contradictories are "Some charity is not virtuous," "Some truths are not valuable," because, while this may be true with a change of interpretation of the original propositions, it does not apply to the conceptions expressed by them as abstract propositions. The rejoinder to any such claim would be that the concrete cases denoted by the terms "some charity," "some truths," etc., are not instances of "charity" or "truth" at all, taken in the abstract sense, but only denominations of their incidents. That is only to say that the terms are used in different senses and so cannot be properly compared for logical purposes. It is not to be denied that such propositions can be given a universal import to suit the rules. But the fact that they are ambiguous and can just as well be interpreted as abstract singular propositions shows that in the latter interpretation they must come under the special law of opposition applicable to such cases.

The importance attaching to such facts is that the proportion of discourse turning upon the use of abstract propositions is so great that the ordinary courses of opposition do not apply to it. This proportion is much greater than that of the concrete singular propositions. Within the domain of pure science, philosophy, and theology, the entire discussion may be made up of such propositions or conceptions. Refutation and contradiction in such cases must, therefore, take the form of totally denying the relation between subject and predicate. This fact, of course, is due to the circumstance that such propositions are singular, and unambiguous in their logical import.

The whole difficulty with ordinary opposition is the fact that it is complicated with two very different properties in propositions which are not related in the same way to opposition. They are the quantity and quality of judgments. In the universal proposition there are both the quantity of the subject and the fact or quality of its connection with the predicate to be dealt with. The denial of the one does not involve the denial of the other, and hence the psychological illusion of mistaking E for the contradictory of A, and *vice versa* is a very natural one, not being an illusion at all when considered from the standpoint of quality. Thus if I deny the proposition, "All men are trees," I may mean to dispute the universality of its truth, and in that instance I require to prove no more than that "Some men are not trees." But I may also mean to deny the connection between the two conceptions taken as denoting an essential element of identity between them, or as indicating that the essential quality of man is found in trees, or that he could not be man without it. The denial in this case must extend to the whole class, because it *in toto* denies the essentiality of the connection. Ordinarily, of course, the emphasis upon the quantity of such propositions is so distinct that the denial applies only to their universality, and not to their quality. This liability to illusion does not occur with singular propositions, because their quantity is either invariable or cannot be said to exist at all, so that their quality is the only feature that can be altered by a denial or contradiction. But with the ordinary universal there is both the quantity and the quality to be taken into account, and the denial of the former does not involve the denial of the other. To illustrate, if I deny the proposition, "All men are white," I may mean to deny the *universality* of the connection between subject and predicate, in which case I could only assure myself that "Some men are not white." But I may mean to deny the connection itself, or the assertion that white is any part of man at all, in which case I should mean that "No men are white." Every such proposition may be interpreted in two ways, in its *extension* and in its *intension.* Its extension has to do with the numerical value of the subject, and its intension with the qualificative relation between subject and predicate. The difference between these two aspects of the same proposition can be well illustrated by the difference between the propositions "All men are white" and "Man is white," the former being unmistakably quantitative in its primary meaning and the latter singular and signifying in its primary meaning that white is so essential a quality of man that he cannot exist without it. In the former case the contradictory must be "Some men are not white," and in the latter "Man is not white," this being determined by what is denied in the case. Hence if the universal or quantitative proposition be given the double interpretation, as it well may, it will have two contradictories, one based upon its quantity and the other on its quality. This explains why there is a temptation to regard *E* as a contradictory of *A*. Then the fact that propositions like "All men are white" can be conceived as denoting the same as "Man is white," in which the quantitative import is not predominant, shows how the meaning may affect Opposition in determining the relation conceived. Perhaps the case is better illustrated in such propositions as "All the sciences are useful" and "Science is useful." The denial or contradictory of the former might have some of the sciences as useful, but the denial of the latter would not, because it is not only a singular proposition in its real meaning, but indicates what is essential to all the sciences, or that the denial of it must deny the whole in effect. Hence if the universal be given the abstract import, its denial must be of its quality, and not its quantity.

This liability of universal propositions to a double import which permits different contradictions is illustrated in two ways. First we may call attention to the ambiguities latent in the copula, and second we may compare with it the case of a quantified predicate. In regard to first of these, the universal proposition, "All men are mortal," may only express the *empirical fact* of mortality in connection with man, and may not imply any thing regarding the nature of that connection. The copula "is," in such cases, expresses no more than a fact. But if the proposition be conceived as identical with "Man is mortal," the copula has a latent implication regarding the nature or the *necessity* of the connection between man and mortality, so that the denial of it must apply to the whole class, as it would in its equivalent abstract. But in regard to the comparison between ordinary universals and those with a quantified predicate the case is still more clear. Take Hamilton's forms, and the quantified universal would be "All men are all the mortals." Now it is to be noticed that the contradictory of this is not necessarily "Some men are not all the mortals," or "Some men are not mortals," but may be "All men are not all the mortals." The case depends wholly upon the question whether it is the subject or the predicate that is denied. This is perfectly clear in such propositions, and it only indicates what must hold good in the case between the extensive and the intensive import of any universal judgment. The denial is not necessarily limited to its quantity, that is, the quantity of the subject, but may be applied to the relation between subject and predicate conceived as a necessary one. But apart from the truth of this claim in regard to ordinary universals, there can be no question regarding abstract propositions that are singular in their import. In them the relation between quantity and quality is such that a particular is impossible, and hence the contradictory will take no account of quantity. When the meaning of ordinary universals, therefore, becomes abstract, as it is very often, they are subject to this law.

It does not require any argument to show the value of all this. If a large, and perhaps the largest part of our reasoning, consists of singular, abstract, and universal propositions taken in an abstract sense, the ordinary rules of Opposition do not apply to them, and hence for the ordinary student we require to reconstruct them, or supplement them by new ones to suit the circumstances not provided for in formal logic. To do this I propose the following classification of propositions, which is designed for Opposition alone, while the problems of the syllogism may be satisfied with the ordinary and simpler account of them.

PROPOSITIONS.
- SINGULAR.
  - Concrete = Socrates was wise.
  - Abstract = Science is useful.
- UNIVERSAL.
  - Distributive = All men are mortal.
  - Collective = All the Germans make a nation.
  - Definitive = Any man is mortal.
- PARTICULAR.
  - Indefinite = Some men are mortal.
  - Partitive = *Some* men are Caucasians.

These propositions may not necessarily differ in form of expression, but in their meaning. Thus the indefinite and partitive particulars are alike in form, while an emphasis upon the word "some" may change its meaning so as to imply a complimentary opposite proposition. Then the same remark can be made regarding the universals. The distributive and collective are alike in their form, but different in their import. The definitive class, or what I may call individuo-universals, still more depends upon what is thought when they are used. It is designed to describe all those where the meaning turns upon the quality and not the quantity of the proposition, and the nearest sign of such cases is the term "any," whose contradictory must be *E* instead of *A*. With these observations it will be apparent that the ordinary canons of Opposition have a very narrow application to practice, and that they must be subject to great modifications in directing the student to the use of them. Only the distributive universals and the indefinite particulars come under the regular rules, and all the others must have new formulas constructed for them. One interesting fact corroborating the position here taken, in classifying abstract propositions with singulars, is the incident that Jevons regarded abstract terms as singular, and I generally find students spontaneously accepting that view and disputing the opposite until a few unquestionably abstract nouns are shown to be general. But a large number of abstract terms have only a singular import, and as concrete singulars have only contradictories, and neither contraries, sub-contraries nor subalterns, the property of singularity in abstract proportions must limit their opposites. I may, therefore, supplement the ordinary canons of Opposition by the following rules, designed to give Opposition greater practical value :

1. All singular propositions, whether concrete or abstract, have only contradictories.
2. Definitive, or individuo-universal propositions also have only contradictories.
3. Collective universals have universal contradictories while their particular contraries are of the same quality with themselves and the subalterns are of the opposite quality.
4. Partitive particulars make *A* and *E*, *A* and *I*, and *E* and *O* contradictories, while a peculiar relation of subalterno-contradiction exists between *A* and *O* and *E* and *I*, and *I* and *O* are reciprocals.
5. Only distributive universals and indefinite particulars follow the ordinary canons of Opposition.

Even these laws can be supplemented by still others founded upon a different set of conditions. Thus far I have assumed that the propositions remain *formally* the same, but differ in contents or meaning. This, of course, is only a distinction between their grammatical or linguistic and their thought form, but it is sufficient to modify the rules for Opposition which must be based upon the *thought* form when it comes to practical reasoning and discourse. But there is an application of the principles of Opposition which is independent of the purely formal character of propositions, and it comes into use where the rules we have indicated are not applicable. It is based upon the relations of terms which are congruent, or inconsistent with each other, or partly congruent and partly inconsistent with each other. They are the generic and specific terms which are very often used in relations implying the existence of Opposition. This, of course, is determined by the matter of thought, and the formal elements by which the rules can be stated are the genus and species involved in the subjects or predicates of the propositions.

Thus, formally, no relations of Opposition would be detected between the propositions, "All Americans are men," and "All Americans are Caucasians," but in reality they are subalterns, the species describing the subalternans and the genus the subalternate, questions of quantity being disregarded. When the subjects are genus and species, and the predicates the same, although the propositions are still subalterns, the relation is simply reversed. This, of course, when the propositions are universals. A more practical illustration of the same subalternation would be, "All knowledge is scientific, but whether scientific or not, is true," and "All knowledge is useful and likewise all biological science," — "knowledge" and "biological science" being genus and species.

In singular propositions a distinct solution must be given. Thus, "Socrates is a man," and "Socrates is a horse," must be regarded as contraries materially, though nothing can be determined formally about them. Then again, "Bismarck is a man" and "Bismarck is a German" are subalterns, the first being the subalternate and the latter the subalternans. And thus the analysis may be carried out with various forms of propositions. Without going through this operation, we may simply formulate a few rules, supplementary to those already mentioned, and dealing with the material import and relations of propositions.

1. In singular propositions, quality remaining the same and affirmative, when the predicates are separate species and the subjects are the same, the propositions are *contraries;* when the predicates are genus and species, they are *subalterns;* if negative, they are *sub-contraries* and *subalterns.*

2. In singular propositions, quality being different, when the predicates are separate species and the subjects are the same, the propositions are *subalterns;* when the predicates are genus and species, they are *sub-contraries.*

3. In definitive universal propositions, quality remaining the same and affirmative, when the predicates are the same and the subjects are genus and species, and *vice versa*, the propositions are *subalterns*, the subalternation, however, in one case being the reverse of the other; if negative, they are *reciprocals*.

4. In definitive universal propositions, quality being different, when the predicates are genus and species, and the subjects the same, the predicate of *A* being the genus, and of *E*, the species, the propositions are *sub-contraries;* but if the predicate of *A* be the species and that of *E* the genus, the propositions are *contraries;* if the predicates are the same and the subjects are genus and species, the propositions are *contradictories*.

Similar rules can be developed much further under other suppositions, but these are sufficient to show the complications of actual thought, and these complications are very much increased with distributive universals. Here we should be involved in two forms of Opposition according as quantity or quality is considered. But I need not remark further on this point. We see sufficient reasons for very natural errors in thinking in the very complexity of the conditions to be observed, and which are entirely independent of the canons of formal logic. They are, of course, only illustrations of what occurs in other fields as well as in that of thought. For instance, we may have a rule for deducing the sum of the angles of a triangle in pure mathematics, but in actual triangles we may either require a distinct method for this purpose, or observe antecedent precautions for determining the perfection of our triangles. This is only to say that in constructing actual triangles we may be under great incertitude as to their perfection. Also in the construction of bridges or houses, we cannot rely upon the abstract and theoretical strength of materials. We have to take them three or four times as strong as the theory requires. And again, a belt will stretch after use, so that the wheels must either be adjusted to it or some means employed to compensate for the stretching ; and so on indefinitely in almost every field of science and art.

Our abstract rules have to be modified and supplemented by more special principles in order to have any application whatever. This seems to be precisely the case with the ordinary rules for Opposition. They are true and important for the conditions under which they have been formulated, but it is forgotten that they represent very few of the material conditions of common practice, and for that reason they have but a limited value. Logic, that intends to be a guide in practical life, must, therefore, supplement the imperfections of a theory of Opposition that has such a "limited liability" in application by a modified system of principles which conforms to the perplexities and complexities of actual thought, and it can thus lay a better claim to practical importance. I have made an effort in this article, though an imperfect one, to supply such a want, and it is to be trusted that the effort is not wholly unsuccessful. It should be remembered, however, that one of the most important lessons to be learned from the present study is the enormous complexity of the problem to be dealt with, — a complexity which explains the liability of the human mind to logical illusions and the equipment required to meet the responsibilities involved in profound discussions. At the same time I think the analysis above given of Opposition outside formal logic will show the possibility of reducing an apparently chaotic world to law and order, while showing that a large part of our every-day discussion proceeds upon much simpler principles than the common theory of Opposition recognizes.

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